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The purpose of this effort was the development of the software necessary to support the establishment of a Raster Testing System which will test for conformance to CCITT Recommendation T.6. Recommendation T.6 defines the compression algorithm for Group 4 Facsimile. T.6 Compression Testing is part of the general Group 4 Validation System which when complete will test the upper layer protocols of Group 4 Facsimile.

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MODIFICATIONS TO THE GROUP 4 VALIDATION SYSTEM

DECEMBER, 1989

OFFICE OF THE MANAGER
NATIONAL COMMUNICATIONS SYSTEM
WASHINGTON, D.C. 20305

NCS TECHNICAL INFORMATION BULLETIN 89-13

MODIFICATIONS TO THE GROUP 4 VALIDATION SYSTEM

DECEMBER 1989

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FOREWORD

Among the responsibilities assigned to the Office of the Manager, National Communications System, is the management of the Federal Telecommunication Standards Program. Under this program, the NCS, with the assistance of the Federal Telecommunication Standards Committee identifies, develops, and coordinates proposed Federal Standards which either contribute to the interoperability of functionally similar Federal telecommunication systems or telecommunication systems. In developing and coordinating these standards, a considerable amount of effort is expended in initiating and pursuing joint standards development efforts with appropriate technical committees of the International Organization for Standardization, and the International Telegraph and Telephone Consultative Committee of the International Telecommunication Union. This Technical Information Bulletin presents an overview of an effort which is contributing to the development of compatible Federal, national, and international standards in the area of Facsimile. It has been prepared to inform interested Federal activities of the progress of these efforts. Any comments, inputs or statements of requirements which could assist in the advancement of this work are welcome and should be addressed to:

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Modification of

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Table of Contents

Modifications to the Group 4
Validation System

1.0 INTRODUCTION

This document summarizes work performed by Delta Information Systems, Inc., (DIS) for the Office of Technology and Standards of the National Communications System, an organization of the U.S. Government, headed by acting National Communications System Assistant Manager Dennis Bodson. Mr. Bodson is responsible for the management of the Federal Telecommunications Standards Program, which develops telecommunications standards, the use of which is mandatory for all Federal agencies. The purpose of this effort, performed under task order number 87-C-0078-002 of contact number DCA100-87-C-0078, was the development of the software necessary to support the establishment of a Raster Testing System which will test for conformance to CCITT Recommendation T.6. Recommendation T.6 defines the compression algorithm for Group 4 Facsimile. T.6 Compression Testing is part of the general Group 4 Validation System which when complete will test the upper layer protocols of Group 4 Facsimile.

2.0 FUNCTIONAL DESCRIPTION

2.1 Overview

In order to verify that a User facility is conforming to CCITT Recommendation T.6 for Group 4 Raster Image compression and decompression, a conformance verification procedure was developed. This procedure consists of the generation of a Raster Image Tape containing "Standard Images" to be processed by a User requesting verification. The output images from the User process will then be compared against known "Good" images to verify that the compression and decompression algorithms implemented by the User were in accordance with CCITT Recommendation T.6. If errors were found in comparing the Users' output images and the known good images, an error log/listing would be generated identifying where the errors occurred (See Figure 2-1).

In order to support this verification procedure a Group 4 Conformance System was developed. The conformance system consists of three parts:

- Generation of a Standard Raster Image Tape to be processed by the user.
- Validation of the User's raster image tape containing the output images.
- Verification of the User's compression/decompression algorithm.

2.1.1 Raster Image Tape Generation

The generation of the Standard Raster Image Tape consists of writing raster image files to magnetic tape in the format specified by MIL-STD-1840A and MIL-R-28002. This format will be discussed in detail later. Specifically, the raster image tape contains two sets of test image files. The first set of image files contains uncompressed bit-map images to be compressed by the User. The second set of image files contains test images compressed using the CCITT Group 4 algorithm to be decompressed by the User. The two test sets include

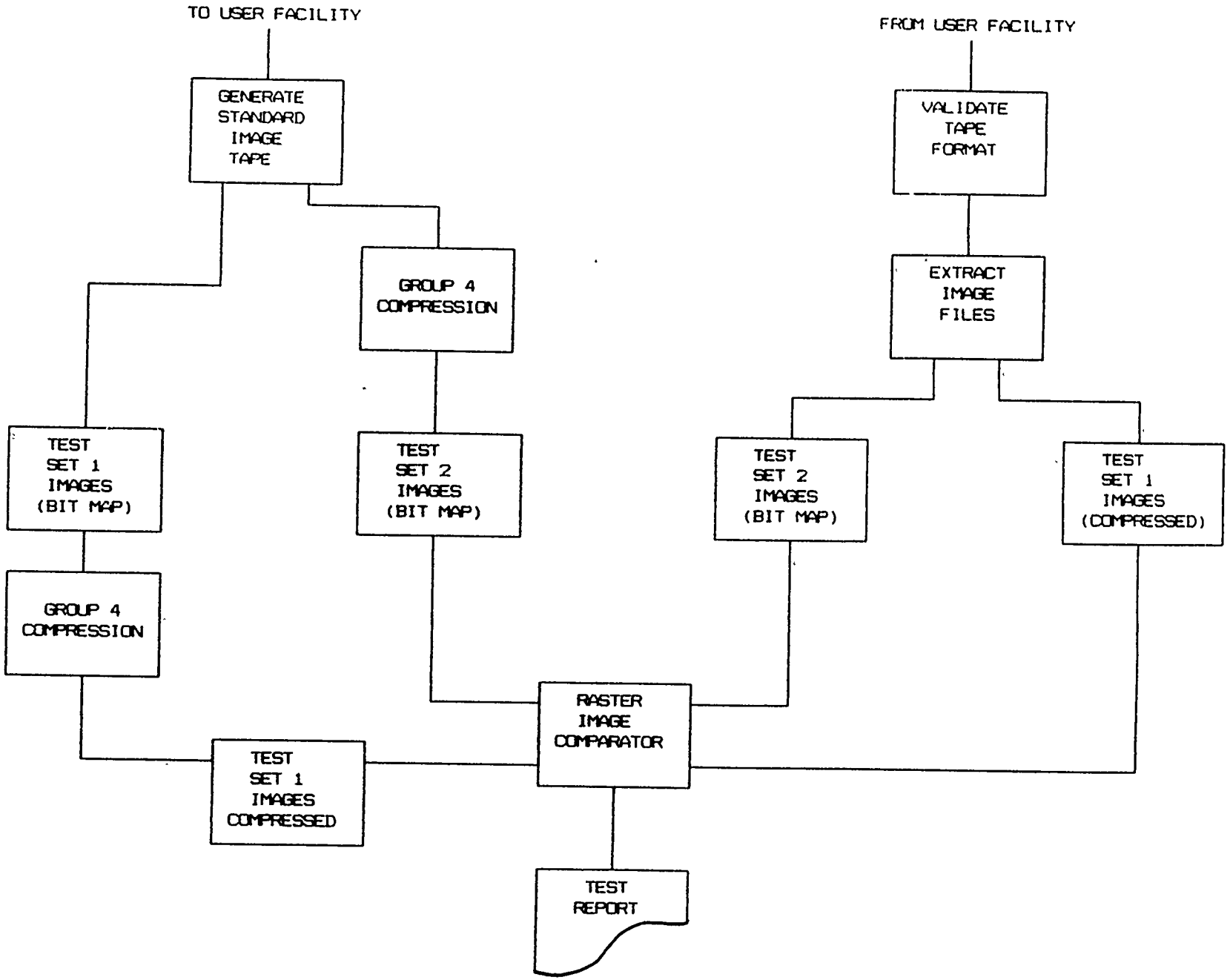


FIGURE 2-1 - CONFORMANCE TESTING SYSTEM

binary images that test not only the User's ability to process different encoding situations but also the ability to handle the different document sizes.

2.1.2 Raster Image Tape Validation

The validation of the User's raster image tape insures that it was written in accordance with MIL-STD-1840A and MIL-R-28002 and that the required number of image files (both compressed and decompressed) are present on the tape. The validation process lists in a log file any discrepancies between the standards and the actual tape format. The image files are also extracted from the tape for further processing.

2.1.3 Verification of Group 4 Compression/Decompression

The verification of the User's compression/decompression algorithm is accomplished by doing a bit-by-bit comparison of the Users' output files with their corresponding "Good" images within the Group 4 Conformance System. This comparison is a two part procedure comparing the bit mapped (uncompressed) images and then the Group 4 encoded (compressed) image files. Any discrepancies will be noted and logged in a Conformance Test Report.

Although the Conformance System was developed specically for the verification of Group 4 Image Compression and Decompression, the software procedures which generate and validate the tape format are not specific to Group 4 Raster Image Tapes. They are capable of processing any ANSI standard labelled tapes. In addition the image file extraction procedure is not specific to raster image files, but can extract any of the file types specified in MIL-STD-1840A (e.g. Page Description Language and SGML Conforming File Sets etc.).

2.2 Tape File Layouts

2.2.1 General Description

The Standard Raster Image Tape Format is defined in MIL-STD-1840A and MIL-R-28002

as mentioned previously. These standards require that the magnetic tape be labelled in accordance with FIBS PUB 79 and also that document declaration files be present describing the document images on the tape. Figure 2-2 shows an example of a raster image tape format. The Volume Header Label (VOL1) identifies the tape and is followed by Header Labels (HDR1 & HDR2), data, and Trailer Labels (EOF1 & EOF2) groups for each data file recorded on the tape. In addition, at least the first data file must be a document declaration file defining the raster images that follow. If multiple documents are present on the tape there must be a document declaration file for each. These declaration files are grouped at the beginning of the tape. The raster image file groups must follow the declaration files in the same order as the declaration files.

2.2.2 Contents

The Volume Tape Label(s) contains the Volume Identification, accessibilty and Owner Identification and is the first record recorded on the tape. The Volume Label(s) is followed by data files which are delimited by Header and Trailer Labels and Tape End of File Marks(TM). The first Header label contains the file identifier (file name), any file set information for the data, generation data, block length and record length information. The trailer labels mirror the header labels, but also contain the tape block count for the data file. The volume labels, header labels and trailer labels are fully defined in FIPS PUB 79 and ANSI Standard X3.27.

As mentioned, the first data file on the tape is a document declaration file describing the raster image files for the first document. The declaration file is

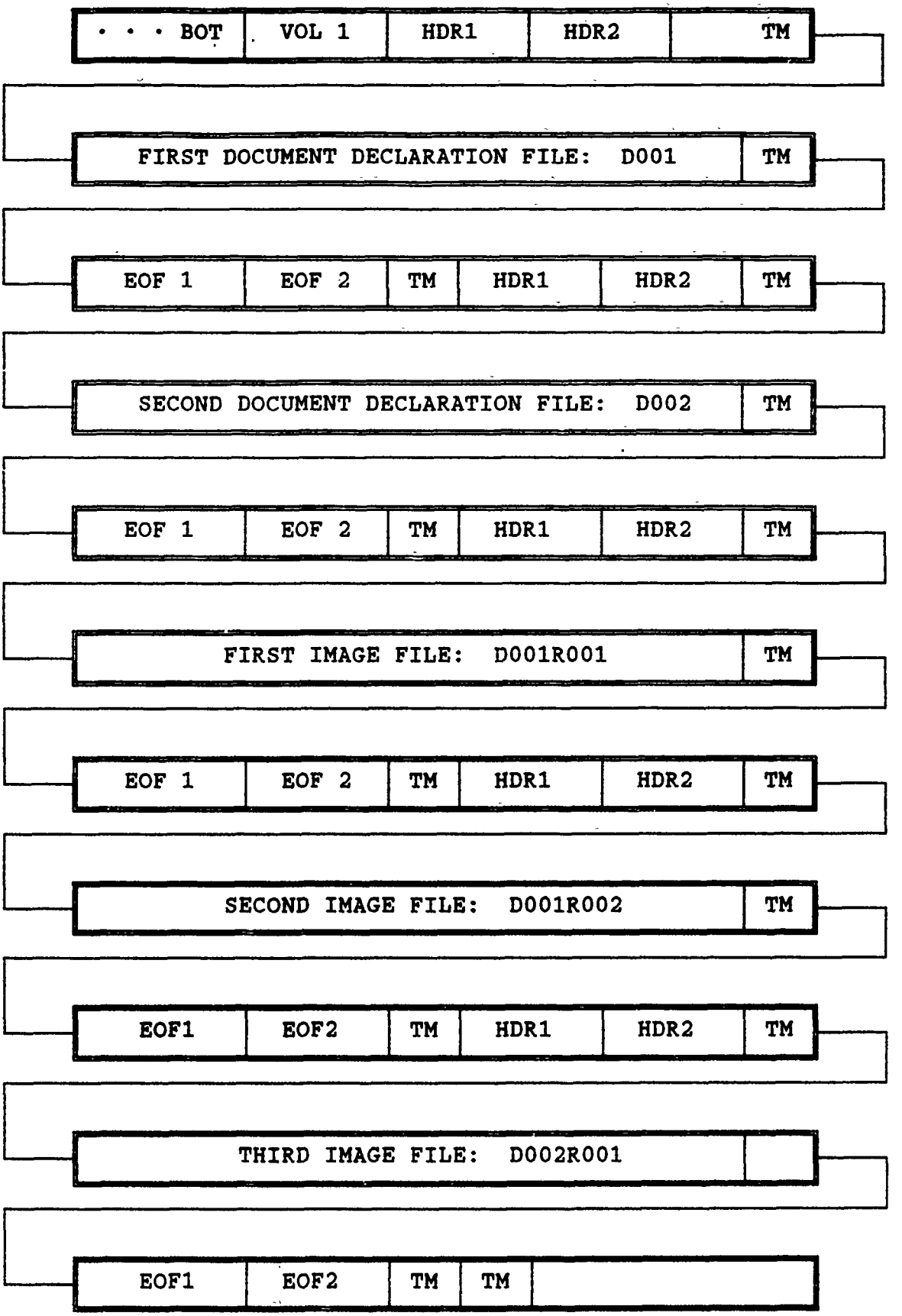


Figure 2-2 - Raster Image Tape Format

comprised of fifteen(15) records. These records contain source and destination identification, revision level, dates, file count and security information for the document (Figure 2-3). If more than one document is recorded on the tape, the document declaration files for all documents are recorded prior to the raster image files for the first document.

The raster image file structure is defined in MIL-STD-1840A and MIL-R-28002. They specify that the image file is comprised of two parts (Figure 2-4). The first part contains the raster file header records that characterize the image encoded by the raster data. All the file header records are in the first block of the file. The second part of the file contains the raster binary data encoded using CCITT Recommendation T.6. The binary data occupies data block 2 through the last block of the file. Since the standards only identify two raster file types, Type 1 -Group 4 encoded and Type 2 - Open Document Architecture encoded, a third raster type for uncompressed raster binary data is required for the Standard Image Tape used in the Conformance System. This third type is Type 9 and is indicated in record 7 of the file header records.

2.3 Procedure/Use

2.3.1 Introduction

The Group 4 Conformance System performs 3 primary functions: tape generation, tape validation, and image verification (Figure 2-5). These functions are assisted by a group of supplemental procedures that aid in the creation and handling of the Standard Raster Image Tape. The tape generation function is supported by the procedures necessary to create/modify ANSI standard labels, create/modify a document declaration file, and creation of the raster image file with its associated header records. The tape validation function is supported by those procedures required to validate the labels, the declaration file and the corresponding tape contents, and also the extraction of the raster image files from the tape for compression/decompression verification. The image verification is supported by the procedures that compare compressed and decompressed binary bit images and identify encoding and decoding errors.

Record 1 - Source System
- Character String containing Name and Address of System of Origin.

Record 2 - Source System Document Identification
- Character String used by the source system to uniquely identify a document.

Record 3 - Source System Related Document Identification
- Character String used by the source system to relate this document to another document.

Record 4 - Highest Revision and Change Level
- Character String indicating revision and change level.

Record 5 - Date of Issue
- Date of Issue or Last change to the document - YYYYMMDD.

Record 6 - Destination System
- Character String containing Name and Address of Destination System.

Record 7 - Destination System Document Identifier
- Character String used by the destination system to uniquely identify a document.

Record 8 - Destination System Related Document Identification
- Character String used by the destination system to relate this document to another document.

Record 9 - Date Of Transfer
- Date the Document was transferred to transmission media.

Record 10 - Delivery Accounting
- Freeform record containing delivery information.

Record 11 - File Count
- Character String Containing number of files and file type e.g. R14 - 14 Raster Image Files.

Record 12 - Title Security Label
- Character string identifying security/sensitivity level on the document title.

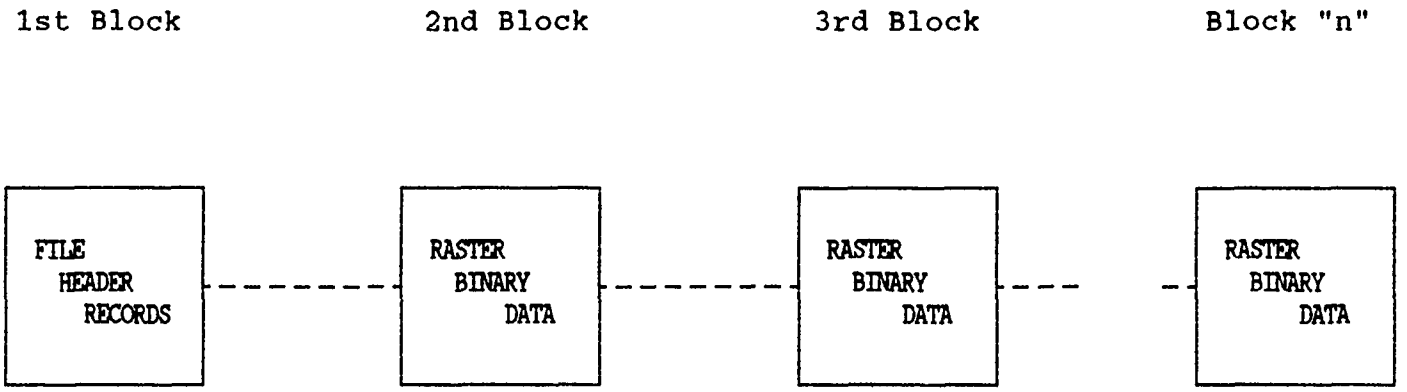
Record 13 - Document Security Label
- Character string identifying security/sensitivity level on any file within the document.

Record 13 - Document Type
- Character String used by source system to uniquely identify a document type.

Record 14 - Document Title
- Character String identifying the document.

Figure 2-3 - Declaration File Record Contents

Raster Image File Tape Blocks



Raster Image Header Record Contents

Record 1 - Source System Document Identifier

Record 2 - Destination System Document Identifier

Record 3 - Text File Identifier

Record 4 - Figure Identifier

Record 5 - Source System Graphics Filename

Record 6 - Data File Security Label

Record 7 - Raster Data Type

Record 8 - Raster Image Orientation

Record 9 - Raster Image Pel Count

Record 10 - Raster Image Density

Record 11 - Notes

Figure 2-4 - Raster Image File Structure

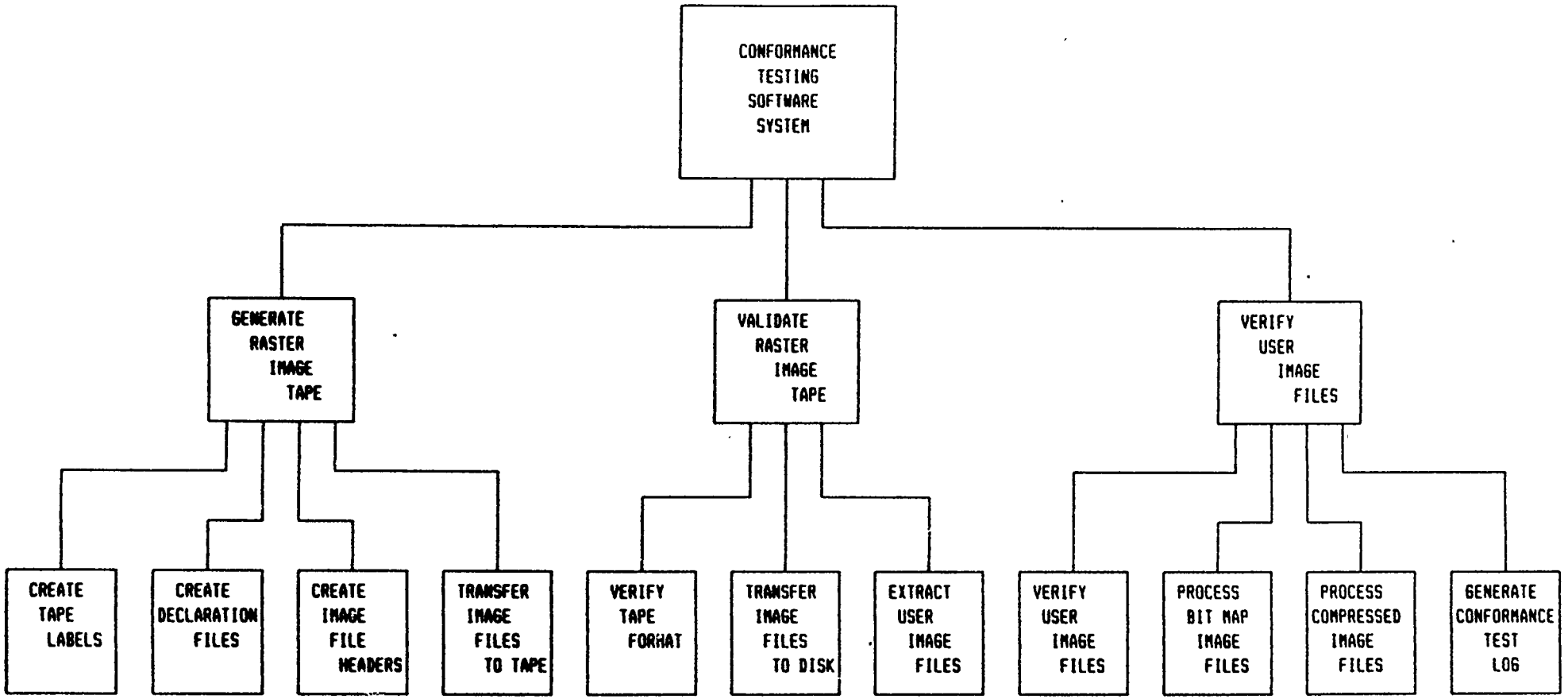


FIGURE 2-5 - FUNCTIONS OF GROUP 4 CONFORMANCE SYSTEM

2.2.2 Image Tape Generation

The Image Tape generation function will write to magnetic tape a set of raster image files as specified by the user. Before the tape generation is actually begun, the system will check for the existence of the required tape labels, declaration files(s) and raster image files with headers. If any of these items are not present, the operator will be informed of the missing item and requested to create the missing item using the appropriate system utility. Once all the items are available, the tape write procedure will be initiated. In the event of a tape failure, the operator will be alerted and prompted for remedial action. Upon completion of the tape generation, a log of the tape contents will be displayed.

2.2.3 Image Tape Validation

The Image Tape validation function checks both the tape format and tape contents. The validation function first reads and logs to the system log file the tape labels while insuring compatibility with the appropriate standards. Each declaration file is then read and the contents of each record are written to the system log file. Upon the completion of the processing of the declaration file(s), the raster image files are processed. Each image file is read with the header records being extracted and written to the system log file for review. If the tape is successfully validated, then the individual raster image files are transferred to disk files. Each of the disk image files is then split into two files. The first file contains the raster image file header records and the second file contains the raster binary data. The raster binary data file and its associated raster header file are now ready for Group 4 verification.

2.2.4 Image Verification

Upon completion of the Image Tape Validation function the binary data from each image file on the input tape is available for Group 4 T.6 verification. The image file header file associated with each image binary data file contains the information needed to properly process the image. The image type information in record 7 of the header records determine whether the image is compressed or uncompresssed. If the image is a type 1, it is a

compressed image and will be compared against the Conformance Systems corresponding "Good" compressed image. If the image is a type 9, it is an uncompressed (bit mapped) image and will be compared against the systems corresponding "Good" uncompressed image. This image, since it is bit mapped, can also be plotted if required. Independent of the image type, any comparison errors will be displayed and logged to the system log file. This process is done for each image on the input tape. If during this process it is found that images are missing (either compressed or uncompressed) from the image tape, the image file names will be logged for evaluation.

3.0 CONCLUSIONS AND RECOMMENDATIONS

Upon completion of the Group 4 Conformance System, some preliminary raster image tapes were processed. During this processing some inconsistencies were found that need clarification.

- Although the ANSI 3.27 specification defines the block pad character as a " ^ " (hex 3e) some tapes used a "space" character. The use of the proper character should be noted in MIL-STD-1840A because of the use of padded blocks in declaration files and raster data files.

- ANSI 3.27 allows variable length blocks within a file on magnetic tape. Because of this, record length errors cannot be detected when reading the image file from tape. If a record length does occur, the image file comparision fails and a compression or decompression error is logged erroneously. To avoid this problem the raster image tape should be a fixed block size.

- MIL-STD-1840A specifies that the raster data file header records are 128 bytes in length. One tape that was processed, specified in Header Label 2 (HDR2) a record length of 512. Since this record length referred to the raster image data record it was correct but inconsistent with the header record block. It should be noted in MIL-STD-1840A that the HDR2 record length field should be 128 since record size in a bit image file is meaningless.

This implementation of the Conformance System only addresses the verification of Group 4 Image compression and decompression in accordance with CCITT Recommendation T.6. As was noted previously, the software that was developed is not specific to Group 4 Images and could be extended to include Raster Type II files encoded using the Open Document Architecture and Interchange Format. Although not currently included within MIL-R-28002, compression and decompression of gray scale images could also be verified by the conformance system.

Another possible extension to the Conformance System is to allow the use of floppy disk

media along with magnetic tape as a method of transmission. With the introduction of the large capacity 3.5" floppy disks (approx. 20 meg), all but the largest uncompressed images can be stored on a single floppy.

4.0 SOFTWARE SPECIFICATIONS

4.1 Introduction

According to government specifications MIL-STD-1840A and MIL-R-28002, raster images are to be stored on magnetic tape in a specialized format which includes information on the raster image itself, and the document of which the raster image is a part, as well as the actual compressed image information. The files are to be stored on 9-track magnetic tape written in accordance with ANSI standard X3.27-1987. The Group 4 Conformance System permits the user to generate a tape in this format consisting of the image data files required. After processing the image data files, the User requesting Group 4 verification returns the output files of their system in the same tape format. The Conformance System validates the image tape and then transfers the raster files from ANSI tape format to a local disk drive. Once the files are transferred the non-image information is stripped from the file leaving only the binary image data for processing. The Users' binary images are then compared against the corresponding Conformance System "Good" image files to insure Group 4 compatibility.

4.1.1 System Functions/Procedures

The Conformance system processing of the raster images is broken down into several procedures, each of which is handled by a single program. In addition, there are several utility programs which aid in the generation of the raster file format information, and in the transfer of files from disk to the tape.

The first procedure is the transfer of the raster image data files to magnetic tape. This is accomplished with the "IMG_XFER_D2T" program. IMG_XFER_D2T is an interactive program, which allows the user to select which files to transfer to tape. In addition to the raster image data files, IMG_XFER_D2T also requires the presence of header and trailer label files, and declaration files to [illegible]ate.

There are several utility programs which aid in the creation and maintenance for the

files required. The program "CREAT_DCLR_FL" aids the user in the creation and editing of document declaration files, which must accompany any document on tape. The program "CREAT_IMG_HDR" helps the generation and modification of raster file header records, and the program "CREAT_LBL_HDR" scans through a disk file and generates the appropriate HDR and EOF files for the user.

In addition, the assembly of a raster image file from raster binary data and header records may be required. This is accomplished by the "IMG_FILE_GEN" program. IMG_FILE_GEN combines the information from two files with the '.HDR' and '.DAT'; the '.HDR' file contains the 11 header labels, and the '.DAT' file contains the raster image information. IMG_FILE_GEN concatenates the two files, padding the .DAT file to a length of one tape block, as per MIL-STD-1840A specs. All of these programs are interactive and are documented in later sections of this document.

The second procedure is the validation and listing of the label and image file information present on the ANSI tape. This process is performed by a "IMG_TAPE_VAL" program. This program verifies the tape format and writes the label information to a System Log file along with the file information present in the Document Declaration Files and their associated Raster Image files. Any discrepancies between the tape being processed and the government specifications will be noted. If the tape format is such that the tape cannot be fully processed, the process will be aborted.

Procedure 3 is the transfer of any raster file from ANSI tape format to a local disk. This is accomplished with the "IMG_XFER_T2D" program. IMG_XFER_T2D is capable of processing fixed and variable length records, with block sizes up to 8192 bytes; fixed length tape files are written as direct access files on disk, and variable length tape files are written as sequential access files on disk. IMG_XFER_T2D may be run in an interactive mode, where the program moves through the tape files sequentially and queries the user whether to transfer each file, or in an automatic mode, where the program simply transfers

every file it encounters to disk. IMG_XFER_T2D generates data files in addition to the 'actual' tape files, which contain information from the tape files' header and trailer label blocks. Each disk file generated has its name prefaced with an operator assigned three character Source Identifier. This is required since image files names will be identical from various user tapes.

Procedure 4 involves separating the raster image header records from the raster image binary data in the image file. This is accomplished by the "IMG_FILE_SPLT" program. The image file is split into two segments; the first segment, with an '.HDR' extender, contains the first 11 records of the file (i.e. the header records), and the second segment, with a '.DAT' extender, contains the actual raster binary image information. At this point, the raster image may be processed.

The fifth and final procedure is the comparison of the image binary data files. The program "IMG_FILE_CMP" performs this function. Using the information present in the raster image header file, the Conformance System compares the User processed image file against the corresponding Conformance System "Good" image file. This comparision is done on a bit-by-bit basis identifying any descrepancies. If the errors found in the User processed file render the remainder of the comparision impossible, the process will abort. All errors found will be logged to the system error log file.

4.2 Software Program Description

4.2.1 Image Transfer Disk to Tape - IMG_XFR_D2T

4.2.1.1 Introduction.

IMG_XFR_D2T is a program designed to use a series of disk files to assemble an ANSI-standard Level III labeled-format magnetic tape. It can process direct and sequential access record files, and can write block lengths on the tape of up to 8192 bytes; segmented records and multi-volume file sets are not supported at this time, nor are block offsets used when writing files. IMG_XFR_D2T is run interactively, and will transfer a single file

or collection of files to magnetic tape.

4.2.1.2 IMG_XFR_D2T Data Inputs

4.2.1.2.1 Disk File Inputs – Storage and Naming Conventions

IMG_XFR_D2T uses several disk files to assemble a single file on magtape. Specifically, IMG_XFR_D2T uses special on-disk label files to specify which files are to be transferred to magnetic tape, and the manner in which to store those files. These label files are given a three character source identification (sid), a two or three letter content code, followed by a three-digit number which is used to indicate the file group to which a label file belongs. The following list specifies the letter codes of the label files, and what information is stored in that type of label file.

sidHDR denotes a file containing header label information

sidEOF denotes a file containing end-of-file label information

sidEOV denotes a file containing end-of-file-section label information from the tape end-of-file-section

Every IMG_XFR_D2T label file must be in sequential-access disk format. The disk files containing the actual image records to be transferred may be either direct-access or sequential-access. The name of the disk file containing the records to be transferred is stored in the HDR data file.

4.2.1.2.2 Disk File Inputs – Contents and Organization

- Header and Trailer Data Files (HDR, EOF, EOV Files)

Header and EOF/EOV (or "trailer") data file records are organized in the same manner for IMG_XFR_D2T's use; therefore a common treatment shall be given.

Each header or trailer data file consists of at least two sequentially-organized records, 80 characters in length. The first record contains, verbatim, the information to be stored in the HDR1, EOF1 or EOV1 label on tape. The second record contains, also verbatim, the information to be stored in the HDR2, EOF2 or EOV2 label on tape. Any additional records contained in a header or trailer data file are ignored by IMG_XFR_D2T. It should be noted at this point that, during operation, IMG_XFR_D2T searches first for an EOFxxx file, and then for an EOVxxx file. If both an EOF and an EOV file are present, IMG_XFR_D2T will always use the EOF file. Therefore, if the user is transferring several files to tape, it would probably be a good idea to purge all EO?xxx files from the disk before creating new trailer data files. This will ensure that IMG_XFR_D2T will not use an old EOF file in place of a new EOV file.

- "Data of Interest" Files (DAT Files)

DAT files contain the actual records to be placed upon the tape, and may consist of either direct access records (i.e. fixed length), or sequential access (i.e. variable length) records. IMG_XFR_D2T determines the type of file, and writes to tape a file using fixed length records if the DAT file is direct access, and variable length records if the DAT file is sequential access.

IMG_XFR_D2T can process fixed or variable length records of up to 2048 characters long; records longer than this will be truncated.

4.2.1.3 Operator Inputs

IMG_XFR_D2T is an interactive program, and will request several pieces of information from the operator. During the course of operation, IMG_XFR_D2T will need to know the range of files to transfer (these numbers correspond to the range of number codes used with the label files) and the name of the file set being transferred.

4.2.1.4 Operation

Upon initiation IMG_XFR_D2T will prompt the operator for the starting and ending numbers to transfer; the operator enters the starting and ending numbers of the file groups to be transferred. If the operator wishes to only transfer one file, then these numbers should be the same. For example, entering '1' as the starting number and '5' as the ending number would transfer file groups 1 through 5 to tape.

IMG_XFR_D2T will also request that the operator input a name for the file set to which the files belong. The default value for this is 'DIS_01'. Operator entries should be 6 characters or less, and should consist entirely of a-characters.

If IMG_XFR_D2T detects the presence of a file named 'VOL.000' it will query the operator whether to transfer this to tape as a volume header label. If the operator wishes to perform this transfer, the tape is rewound and the label is written to tape. If the operator specifies not to transfer the existing Volume header, a new one will be created and written for the current data set.

At this point, operation proceeds fully automatically. IMG_XFR_D2T will process each file group in turn until all are finished. The program will then report the task completed, and exit.

4.2.2 Create Tape Labels - CREAT_LBL_FL

4.2.2.1 Introduction.

In order to transfer files from the local disk drive to magnetic tape in ANSI standard format, the program IMG_XFR_D2T must have several label files available to it, in addition to the actual image files to be transferred. For all files, IMG_XFR_D2T must have an 'HDRxxx' file and an 'EOFxxx' or 'EOVxxx' file; these contain information for the tape file's header and trailer labels. "CREAT_LBL_FL" is a small utility which aids the user in generating these label files.

4.2.2.2 Operation.

After CREAT_LBL_FL is invoked the program will ask the operator for the name of a file to process. If the file is not found, CREAT_LBL_FL will abort the operation. If the file is found, CREAT_LBL_FL will ask the operator several questions about the file, and about the manner in which it is to be stored on tape. First, CREAT_LBL_FL will ask for the file set identifier; this is the set of files of which this file is to be a part. CREAT_LBL_FL will then ask for the block length to be used in the tape file; the default block length is 2048 bytes. If the file is direct-access, CREAT_LBL_FL will preset the record length; if the file is sequential-access, CREAT_LBL_FL will query the operator for the maximum record length (default is 128 bytes). Finally, CREAT_LBL_FL will ask for the extension for the data files it is to write, e.g. if the user enters '12', CREAT_LBL_FL will write data files HDR012, EOF012.

4.2.3 Create Declaration File - CREAT_DCLR_FL

4.2.3.1 Introduction

All government documents generated in accordance with MIL-STD-1840A have accompanying them a document declaration file, which helps in the unification and reproduction of the document. The declaration file provides information about the identifications, source, destination, classification, and other information about the document, and gives a count of the files in the set of files that make up a complete document.

CREAT_DCLR_FL is designed to aid in the creation of declaration files for government documents. Through a series of menus, the operator is allowed to create new declaration files, and view and update old files. Although some error checking is performed, most of the responsibility of ensuring the validity of the entries lies with the operator. CREAT_DCLR_FL creates, in addition to the declaration file, header and trailer data files needed by IMG_XFR_D2T to transfer the file to ANSI-standard magtape.

4.2.3.2 Operation

Upon initiation CREAT_DCLR_FL will prompt the operator for the Declaration file name to process and whether the file is to be created or updated. File names must be of the proper form for the declaration file, i.e. 'Dxxx', where xxx = 001...999. If the operator elects to create a new file, CREAT_DCLR_FL will query the operator for non-default entries, and then proceed to the main editing menu. If the operator elects to update an existing file, CREAT_DCLR_FL will attempt to read in the current contents of the filed specified. If the file is found, it is loaded and the program presents the operator with the main editing menu. If the file is not found, CREAT_DCLR_FL enters the file creation sequence and begins the generation of a new file, as if the operator had requested creation of a new file.

The main editing menu displays the first 75 characters of each of the fifteen declaration file records. The operator may elect to edit any record by entering the number of that record, or to exit and save by entering 'x' at the prompt. The fifteen records are:

1. Source system (srcsys:). A character string containing the name, address and other information needed to identify the system from which the information originated (has default value).

2. Source system document identifier (srcdocid:). This is the character string used by the source system to identify a document, such as a technical publication number, engineering drawing number or database file set identifier (has no default value).

3. Source system related document identifier (srcrelid:). This record contains a character string used by the source system to identify another document to which this document is closely related, for example a supplementary document (has default of NONE).

4. Highest revision and change level in the document (chglvl:). This record indicates the revision, level and date of the document If no changes have been made this record should contain the word "ORIGINAL" along with the date. Date format is YYYYMMDD, where YYYY is the year, MM is the month and DD is the day of the month (has no default).

5. Date of issue of the latest change to the document (dteisu:). If the document is an original, this should be the date the document was issued. Date format, as before, is YYYYMMDD, where YYYY is the year, MM is the month, and DD is the day of the month of issue (has no default).

6. Destination system (dstsys:). This contains the name, address and other information needed to identify the destination system to which the document is going (has no default).

7. Destination system document identifier (dstdocid:). This record contains the character string used by the destination system to uniquely identify the document, i.e. this could be the service or agency document number (has no default).

8. Destination system related document identifier (dstrelid:). This is a character string used by the destination system to identify another document to which this document is closely related, i.e. a document to which this document is a supplement (has default of NONE).

9. Date of transfer (dtetrn:). This is the date the document was transferred by the

source system to the transmission media. Date format is YYYYMMDD, where YYYY = year, MM = month and DD = day of the month the file was transferred (has no default).

10. Delivery accounting (dlvacc:). A free form record, this gives delivery information specified by the contract or other agreement, such as the contract number (has default of NONE).

11. File count (filcnt:). This record specifies the number and type of files which comprise the document. See page 18 of MIL-STD-1840A for the list of file codes (has no default).

12. Title security label (ttlcls:). This states the security / sensitivity level or other restriction on the title of the document (has default of Unclassified).

13. Document security label (doccls:). This states the highest security / sensitivity level or other restriction on any file in the document (has default of Unclassified).

14. Document type (doctyp:). This is a character string which the source system uses to identify a document or engineering drawing type, such as job guide, schematic diagram, work card or assembly drawing (has no default).

15. Document title (docttl:). This is a character string identifying the document, for example a technical publication or engineering drawing title (has no default).

The operator may modify any or all of these from the change menu. When creating a new

file, CREAT_DCLR_FL will request that the operator enter a value for every label which does not have a default value, and then present the operator with the change menu. After loading a file, CREAT_DCLR_FL proceeds directly to the change menu.

When the operator enters the number of a record to edit, CREAT_DCLR_FL first presents all of the label, not just the first 75 characters. The operator may at this time elect to return to the change menu, or to edit the record. If the operator decides to edit the record, CREAT_DCLR_FL will step the operator through the correct generation of the label. For instance, when modifying record number 11, file counts, CREAT_DCLR_FL will present the operator with each of the file types in turn, and the operator enters the number of files of each type. In many cases, as the input could be a general string, CREAT_DCLR_FL cannot provide extensive error checking; for these records, CREST_DCLR_FL accepts a general string for the input, which the operator must ensure is correct.

When finished creating or editing the file, the operator may enter 'x' at the change menu prompt to leave. The operator is first asked for the Source Identification (sid). The operator is then asked what name to save the file under; by simply pressing [ENTER] the filename 'sidD001' is selected. CREAT_DCLR_FL then saves the file to disk, and proceeds to header and trailer data file generation. The extenders for the header and trailer data files are taken from the name of the file to be saved; if the declaration file name is 'sidD027,' then CREAT_DCLR_FL creates header and trailer data files named 'sidHDR027' and 'sidEOF027.' Therefore, the operator should take some care not to overwrite existing header and trailer data file.

4.2.4 Create Image Header – CREAT_IMG_HDR

4.2.4.1 Introduction

A raster image data file written to government specifications has a header block, which contains 11 records. These records contain information which aids in the retrieval and reconstruction of the image. CREAT_IMG_HDR is designed to help automate the process of

generating header records for raster files, in accordance with MIL-STD-1840A and MIL-R-28002.

4.2.4.2 Operation

Upon initiation, CREAT_IMG_HDR will request the name of the data file header to be created or updated interactively. The name of the data file header to be loaded must be of the form 'DxxxRyyy', where xxx = a three-digit number from 001 to 999 (indicating the document of which this raster file is a part), and yyy = a three-digit number (indicating the raster file number within this document).

If the operator specifies the update option, CREAT_IMG_HDR will search for the specified file and, if found, load it into memory and proceed to the header record edit menu. If, when attempting to load, the data file is not found, CREAT_IMG_HDR will go directly to the header record edit menu, with default values for the records in place. If the operator specifies file creation, CREAT_IMG_HDR proceeds directly to the header record edit menu, with default values for the records in place.

As each record is processed only the first 75 characters of each record are displayed. Each record is actually 128 characters long, but screen limitations prohibit the display of all characters in the record edit menu. The operator may select which record to edit by entering the number of the record at the prompt, or may exit the record edit menu by entering 'x' or 'X' at the prompt.

When editing a record, CREAT_IMG_HDR will perform error checking on inputs when possible; as always, the majority of the responsibility for error checking falls to the operator. Special care should be taken when inputting information into record 1 (srcdocid) if the file is a product data file.

Modifying Records

Any record may be selected for modification from the record edit menu by entering its

number and then following the prompts. Whenever possible, CREAT_IMG_HDR will provide a list of default values, and check for the validity of input numbers and character strings.

Record 1 – Source system document identifier (srcdocid:).

For technical publications, this record shall be identical to record 1 of the text file which references this illustration. For product data files, this record is defined in paragraph 5.1.5. of MIL-STD-1840A and paragraphs 5.1.9 (a) (1) through (21) of MIL-STD-804 (dealing with aperture card formats).

Record 2 – Destination system document identifier (dstdocid:).

This record contains the destination organization's document number, for example the technical publication number. For technical publications, this record is identical to header record 2 of the text data file which references it, and to record 7 of the declaration file (dstdocid).

Record 3 – Text file identifier (txtfilid:).

For illustration data files the contents of this record are identical to record 3 of the text data file which references this illustration. For raster file page images of technical publications, this record contains the page number of the page stored in the raster file. For product data, this record contains the string 'NONE'.

Record 4 – Figure identifier (figid:).

For technical publications, the figure identifier is the figure number with which the figure is referenced. For product data, this record contains the string 'NONE'. (See paragraph 5.1.4.4 of MIL-STD-1840A for additional information of figure identification in technical publications)

Record 5 - **Source system graphics filename (srcgph:).**

For product data files, this record contains the string 'NONE'; for technical publications, see MIL-STD-1840A, pages 22ff.

Record 6 - **Data file security label (doccls:).**

This is a character string stating the security/sensitivity level or other restrictions on the data file.

Record 7 - **Raster data type (rtype:).**

This is a single digit representing the type of raster data contained in the following file. A '1' indicates a Type I (untiled) raster file; a '2' indicates a Type II (tiled) raster file. For testing purposes, the digit '9' may be appended to indicate that the raster file is stored in binary bitmap image.

Record 8 - **Raster image orientation (rorient:).**

This record contains two right-justified, three-character strings separated by a comma, indicating respectively the direction of the progression of successive pels along a path relative to the horizontal, and the direction of the progression of successive lines relative to the pel path. CREAT_IMG_HDR will allow entry of values specified as permissible by MIL-R-28002.

Record 9 - **Raster image pel count (rpelcnt:).**

Two right-justified, six-character strings separated by a comma are used to specify the integer count of pels in the pel path, and lines in the progression direction. These values are dependent upon pel density per inch, and upon image size. MIL-R-28002 contains tables for pel counts for various size images (North American and Metric) at

200 pels per inch; this table may be used to extrapolate for additional pel and line counts. CREAT_IMG_HDR provides no error checking here; therefore, it is advisable to double-check when entering these values.

Record 10 - Raster image density (rdensty:).

This is a one right-justified, four-character string specifying the raster image density. CREAT_IMG_HDR allows entry of values defined as permissible by MIL-R-28002 only.

Record 11 - Notes (notes:).

This is a free-form field which can contain any special or additional information pertaining to the document or its reconstruction or use.

4.2.5 IMG_FILE_GEN

4.2.5.1 Introduction.

IMG_FILE_GEN is a utility program designed to join header data and raster file information into one file, as per government documents MIL-STD-184GA and MIL-R-28002.

4.2.5.2 Operation.

Upon initiation, IMG_FILE_GEN prompts the operator for the name of the raster data file to create. In order to create the file, IMG_FILE_GEN expects two direct-access files to be present. These files have the same name as specified by the operator with an identifying extension. The file which contains the header records has the extension '.HDR' and the file which contains the image data has the extension '.DAT'; both of these files must be present for the program to run. For example, if IMG_FILE_GEN sidD023R001 were entered, IMG_FILE_GEN would expect to find files sidD023R001.HDR and sidD023R001.DAT for the data and image files, respectively, where 'sid' is the source identification.

After transferring the 11 header records to the target file, IMG_FILE_GEN appends 5

records, each consisting of 128 caret symbols ('^'), to pad out the first block. IMG_FILE_GEN then transfers all of the records from the image data file to the target file starting in block two. IMG_FILE_GEN also writes header and trailer label files, which are used by the IMG_XFR_D2T file to transfer files from disk to magtape.

4.2.6 Image Tape Validation – IMG_TAPE_VAL

4.2.6.1 Introduction

IMG_TAPE_VAL is a program designed to read and validate an ANSI Standard Raster Image Tape format. The image tape format is defined by ANSI Standard X3.27, Mil-Std-1840a and Mil-R-28002. These standards fully specify both the format and contents of all data records present on the magnetic tape. The IMG_TAPE_VAL program assures that the raster image tape was written in accordance with these standards.

4.2.6.2 Operation

Upon initiation, IMG_TAPE_VAL prompts the operator for a three character tape identification id (user/source id – e.g. DIS) which is prefaced to the output log file generated by the tape validation process. The raster image tape is then read and verified in a sequential manner. All label records are formatted and written to the system log file as they are processed. As the contents of the declaration file(s) is (are) read, this information is also formatted and written to the system log file. Finally, as each Image file is processed, the header records are extracted from the Image file and formatted and written to the system log file. If the label format, the label contents, the declaration file contents or the raster image file contents are found to be incorrect, this will be noted in the system log file. In the event that an error is found in the format of the tape, the error will be noted in the log file and the operator will be asked whether to continue or not. Since an improperly formatted tape could cause the validation program to "get out of step" with the input tape, processing from this point on may be futile and cause a great many additional errors.

Upon sucessful completion of the validation process, the system log file can be reviewed for additonal verification of the tape format and also to identify what raster images are present on the tape. If the tape cannot be processed successfully, the system log can be reviewed to identify that area of the tape which is in error.

4.2.6.3 IMG_TAPE_VAL Data Inputs

The operator is requested to input a three character id to be used as a file preface for the system log file. This id should in some way relate to the source of the image tape being validated (e.g. Delta Information Systems - DIS).

4.2.6.4 Program Output

The IMG_TAPE_VAL program generates a formatted log file which can be either displayed or printed. The file is a sequential file, consisting of ASCII records containing the contents of the labels, declaration file(s), and the raster image file header records from each image file on the tape. It also contains error indication records, identifying areas of the tape where errors occurred.

4.2.7 Image Transfer Tape to Disk - IMG_XFR_T2D

4.2.7.1 Introduction.

IMG_XFR_T2D is designed to transfer files from a Level I, II or III ANSI-standard nine-track magnetic tape in labeled-file format, to a collection of files on a local disk. The program can handle "standard" ANSI with block lengths up to 8192 bytes. IMG_XFR_T2D can be set to read all files on a tape to the disk in a "batch" dump, or can be instructed which files to read using an "ask as found" system, and the user may also specify a 'first file' to read in, in which case IMG_XFR_T2D will search through the tape for that file before commencing automatic or queried transfer. The transfer of a file(s) from tape to disk is independent of the file type and will transfer the declaration files as well as the raster

image files.

4.2.7.2 Operation

Upon initiation, IMG_XFR_T2D prompts the operator for a three character tape identification Id. This Id should be identical to the one specified in the tape validation process so that the system log for the image tape and the files transferred from the tape can be identified easily. As was mentioned previously, the file transfer can be in either a "batch" mode or in an "ask as found" mode. In the case of fully automatic transfer or "batch" mode, operation will proceed until: the last file on the tape has been transferred to disk; the disk runs out of room (which generates an I/O error), or a tape read error is encountered. If a file-by-file query is specified, operation on a given file will continue until the file is completely transferred, the disk runs out of room, or a tape error is discovered. After a file is read or bypassed, if the last file just processed is not the last file on the tape, IMG_XFR_T2D will ask whether to read or bypass the next file. If the file just read or bypassed was the last file on tape, the program will exit.

If the tape's volume header label is missing, the operator has the option of terminating operation, or continuing despite the missing label. If, in a given file, the number of blocks counted by the program does not match the number of blocks specified in the trailer label, IMG_XFR_T2D will notify the user and give the option of continuing operation, or aborting the read.

Please note that IMG_XFR_T2D does not save header, trailer and volume labels other than those required by the ANSI standard. Labels which are saved are: VOL1 for the volume; HDR1 and HDR2, EOF1 and EOF2 or EOV1 and EOV2 for each file within the volume. Other labels are not saved (these labels are HDR3..9, EOF3..9, EOV3..9, VOL2..9, UVL1..9, UHLx and UTLx, where x = an a-character) and are ignored by IMG_XFR_T2D in the course of operations.

4.2.7.3 IMG_XFR_T2D Data Inputs.

In fully automatic operation, all of IMG_XFR_T2D's input is supplied by the tape being read, unless the program requires input because of an error condition (missing volume label, block count mismatch). In the file-by-file query mode, the program requires the operator to input a 'Y' or 'y' to read the file, a 'N' or 'n' input to skip the file, or a 'Q'or 'q' to quit the operation. The operator may also elect to enter a filename, which IMG_XFR_T2D will search for before performing any transfers. When the file is located, IMG_XFR_T2D will begin automatic or queried transfers, starting with the named file (note: if the operator selected queried transfer, IMG_XFR_T2D will first transfer the named file, and then do a file-by-file query on all subsequent files).

4.2.7.4 Program Output

All data read from the tape files (with the exception of extraneous labels) are stored in disk files. Status reports are sent to the screen when appropriate, as are error messages and queries.

4.2.7.4.1 Disk File Output - Storage and Naming Conventions

IMG_XFR_T2D creates two classes of disk files as its output. The first class of files stores information about the way the tape file was stored, such as labels, number of records, etc. The second class of files stores the actual records from the tape file, and are known as "data-of-interest," or DAT, files.

Each DAT file from the tape has associated with it several information files. IMG_XFR_T2D information file names consist of a three character Source Identification (sid), a two or three character code followed by a three digit number identifying the ordinal place the file had on the tape. The information file names and the information they contain are:

sidHDRnnn – contains information from the HDR1 and HDR2 label of the file.

sidEOFnnn – contains information from the EOF1 and EOF2 labels of the file.*

sidEOVnnn – contains information from the EOV1 and EOV2 labels the file.*

* **a given DAT file will have associated with it either an EOF or an EOV information file, but not both.**

All of the information files IMG_XFR_T2D creates are sequential access files. A given DAT file will be sequential access if the original tape file consisted of variable length records, or direct access if the original tape file consisted of fixed length records. This is done to preserve, as closely as possible, th iginal structure of the tape file on disk.

The names of the DAT files are taken from the file identifier in Header Label 1.

4.2.7.4.2 Disk File Output – Contents and Organization

– Header and Trailer Information Files (HDR, EOF, EOV Files)

Header and trailer information files (HDR, EOF and EOV files) are recorded using the same structure by IMG_XFR_T2D; therefore, a common treatment of their organization shall be given.

Each header or trailer information file recorded by IMG_XFR_T2D consists of exactly two sequential access records, each record 80 characters long. The first record contains, verbatim, the information stored in the file's HDR1, EOF1 or EOV1 label; the second record contains, verbatim, the information stored in the file's HDR2, EOF2 or EOV2 label.

– "Information-of-Interest" Files ("DAT" Files)

IMG_XFR_T2D was designed to transfer files from tape to disk in a manner which modifies the original structure of the record as little as possible, while allowing it to remain usable to already existing image compression and decompression programs. Therefore, the

file will be written in one of two formats, depending upon the tape file's record format.

If the original tape file consisted of fixed length records, IMG_XFR_T2D will place the records in a direct access disk file. If the original tape file consisted of variable length records, IMG_XFR_T2D will place the records in a sequential access disk file. The sequential access disk file will not contain the RCW (record control word) from the tape records, but only the actual records.

4.2.8 Image File Split - IMG_FILE_SPLT

4.2.8.1 Introduction

IMG_FILE_SPLT is a utility program designed to split a raster image file, as specified in MIL-STD-1840A and MIL-R-28002, into a header record file, and an image data file. The header record file contains the 11 header records which contain information about the raster file; the image data file contains all of the encoded picture information.

4.2.8.2 Operation

The IMG_FILE_SPLT program prompts for the name of the raster image file to be processed. If the file cannot be found the operation will be aborted. After verifying the existence of a raster data file, IMG_FILE_SPLT will split the file into two separate files, which are given the original file's name with separate extenders. The header records are placed in a direct-access file with the extension '.HDR,' and the image binary data is placed in a direct-access file with the extension '.DAT.' Therefore, if the original file was named 'sidD001R027,' IMG_FILE_SPLT would create two files named 'sidD001R027.HDR' (for the header records) and 'sidD001R027.DAT' (for the raster image binary data).

4.2.9 Raster Image Verification - IMG_FILE_CMP

4.2.9.1 Introduction

With the completion of the image file split, the resulting raster binary data files are

ready to be processed by the Conformance System comparator software for Recommmendation T.6 verification. At this time the information for each image file consists of a header record file and a raster binary data file. The header record file contains the image identification and characteristics. The raster binary data file is the compressed or uncompressed data for that image. The comparison software using the header information, selects the corresponding Conformance System "good" image and compares it against the image to be verified. If the image compares successfully, the file is marked as verified. If the image compare fails, an image error message is displayed and logged along with the information required to identify the error type and where in the image it occurred.

4.2.9.2. Operation

The IMG_FILE_CMP program prompts the operator for the 3 character Id assigned previously to the image files as they were transferred from tape. The operator is then prompted for the names of the image files to be verified. Once the image file selection is complete, the comparison software will open the disk files (header & data) for the image file to be verified. Using the file identification information in the header file the corresponding "good" image file is opened. The header file information describing the image to be verified is compared against the Conformance System image information. Any descrepancies will be displayed/logged, and the operator will be asked whether to continue or not. If the information agrees, the raster binary data comparison will be done. If a miscompare is detected and the file type being compared is an uncompressed (bit mapped) image, the line number and bit position within the image will be displayed and logged. The operator will be asked whether to continue or not. If the operator decides to continue, the comparison will restart at the next bit position. If a miscompare is detected and the file type being compared is a compressed (encoded) image, the bit position within the image will be displayed and logged. The comparison will terminate at this point since further comparison is meaningless. If the comparison of the User's image with the Conformance System's image is successful, the

Image name will be logged with a completed status.

4.2.9.3 IMG_FILE_CMP Data Inputs

The operator is required to input the 3 character User ID in order to identify the User's Image file set to be processed. In addition, the operator will be requested to input the name(s) of the image file(s) to be processed/compared.

4.2.9.4 Program Output

The IMG_FILE_CMP program generates a formatted system log which consists of the listing of each file name processed and also the results of the comparison. This log will also list any errors that occurred during the processing of an image file.

5.0 APPENDICES

5.1 Testing Procedure for Systems Undergoing Conformance Testing

5.1.1 Introduction

Raster image processing performed in accordance with the government standards and specifications MIL-STD-1840A and MIL-R-28002 may be thought of as occurring in two distinct phases. The first phase of operation involves the storage and retrieval of raster image files, along with other related files, from a mass storage medium of some sort. The second phase of operation involves the compression, decompression or other manipulation of the stored images. The testing procedure outlined in this document is designed to test a system's ability to retrieve, process and store images in compliance with MIL-STD-1840A and MIL-R-28002.

The system being tested must be able to retrieve the images from 9-track magnetic tape, process the images in the manner indicated by the testing procedure, and store the images back to tape in the format set forth in MIL-STD-1840A and MIL-R-28002.

Because part of the test package consists of binary bitmapped images, it is assumed that the system being tested has the ability to compress and generate binary bitmap images in the course of operation.

5.1.2 Features to be tested

Not all aspects of MIL-STD-1840A concern the processing of raster image files. This test procedure is designed to test only those features which have bearing upon image processing as defined in MIL-STD-1840A and MIL-R-28002; other features described in these documents

are outside the provence of raster image processing and will not be tested.

The following features set forth in MIL-STD-1840A shall be tested:

- magnetic tape format and naming conventions, as described in paragraphs 5.1.1, 5.1.3, and 5.2.1.
- document declaration file
    - o all 15 records must be present
    - o all 15 records must contain valid and correct information[1]
- raster data file header records
    - o all 11 records must be present
    - o all 11 records must contain valid and correct information[2]

The features specified in MIL-R-28002 shall be tested using two sets of raster images. One set shall consist of binary bitmap images; the other set shall be encoded in Group 4 code. Each set shall constitute one document. Both documents may be stored on a single magnetic tape, or each document may be stored on a separate tape. Each set of images is designed to test the system's processing ability for a variety of different image sizes and coding situations. In general, the images will run from the simplest to the most complex. Images in the two documents will be similar but not identical.

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[1] Specific values permissible for the document declaration file record entries may be found in Appendix A.

[2] Specific values permissible for raster data file header record entries may be found in Appendix B.

The test images will be designed to verify the system's ability to handle the following situations:

- page sizes from A through K (North American), (See TABLE I) and A4 through A0 (Metric)

  - o testing will not include non-standard image sizes
  - o every page size will be present in the test set, although every test size may not appear in each document

- coding of pass mode, vertical modes, and horizontal modes

  - o all horizontal codes shall be tested

- lines and images with a compression factor of less than one

- compressed images with incorrect encoding to check error recovery

  - o error report should include location at which error was detected
  - o images incorrectly encoded need not be returned as part of the processed test set

Table I -
NORTH AMERICAN DRAWING SIZES

DRAWING SIZE	WxL (max) inches	PELS PER LINE	LINES PER DRAWING
A	8.5x11	1728	2200
B	11x17	2240	3400
C	17x22	3456	4400
D	22x34	4416	6800
E	34x44	6848	8800
F	28x40	5632	8000
G	11x90	2240	18000
H	28x143	5632	26000
J	34x176	6848	35200
K	40x143	8064	28600

The images themselves may consist of scanned and/or computer generated images.

5.1.3 Features not to be tested

The following features of MIL-STD-1840A and MIL-R-28002 shall not be tested:

- ability to process any document file type other than

raster images

- ability to process Type II documents (tiled format)
- ability to convert between wrap and non-wrap compression

5.1.4. Testing environment limitations and modifications

For the purposes of this test, the following modifications to the standards and specifications set forth in MIL-STD-1840A and MIL-R-28002 shall apply:

- magnetic tape density shall be limited to 1600 cpi
- image pel density shall be limited to 200 pels per inch
- image orientation shall be limited 000,270 (portrait) or 090,270 (landscape) orientation
- record 7 in the raster data file headers must contain a '9' instead of a '1' or '2' if the image is a binary bitmap image; this is done in order to allow the identification of binary bitmap images. Note that this is NOT in accordance with MIL-STD-1840A and MIL-R-28002 and is to be used only for the purposes and duration of this test.

5.1.5 General testing procedure

The organization responsible for the system being tested performs the first part of the test procedure by submitting a request to the Conformance Testing Laboratory ("test facility"), which will assemble and return a test package. This test package will consist of two sets of raster image files, stored in accordance with MIL-STD-1840A and MIL-

R-28002 and organized into two documents. The first set (or document) will consist of uncompressed, binary bitmap images of various size and content. The second set will consist of images compressed in accordance with CCITT Group 4 encoding of various size and similar (though not identical) content to the first set.

The system being tested will then compress the uncompressed images (from set 1) using the Group 4 algorithm, and decompress the compressed images (from set 2). Both groups of images will then be written back to magnetic tape in MIL-STD-1840A and MIL-R-28002 format. These image sets will then be returned to the test facility, along with all completed documentation forms and any additional information necessary.

The test facility will then process the two image sets. The compressed images from set 1 will be decompressed and compared to the original binary bitmap images. The decompressed images from set 2 will be recompressed and compared to the original compressed images. This procedure verifies the image processing, as well as the information contained in the raster data file header records regarding image orientation and dimension, and pel density. The results of this comparison will be documented and included in a conformance test report. The test facility will then notify the system undergoing testing and the CALS DSREDS/EDCARS Management Group of the test results, along with a recommendation for acceptance or rejection of the system being tested. This recommendation signifies conformance under the specified system only, does not indicate whether the system being tested will conform or not under a different configuration. The CALS DSREDS/EDCARS Management Group has final authority over acceptance and rejection. If accepted, a Letter of Certification will be issued to

the system being tested, which is valid only under the configuration under which the test was performed.

Appendix A: Permissible Values for Document Declaration File Records

All 15 records in the document declaration file must be present, and contain valid and correct information. A list of the records, and the information which they must contain, followed by a sample document declaration file.

Record 1 - srcsys:. This record must contain the name and address of the organization responsible for the system being tested.

Record 2 - srcdocid:. This record must contain a test identification number, supplied by the test facility.

Record 3 - srcrelid: NONE

Record 4 - chglvl: ORIGINAL, YYYYMMDD

Record 5 - dteisu: YYYYMMDD (this date should be the same as the date in record 4)

Record 6 - dstsys:. This record should contain the name and address of the test facility.

Record 7 - dstdocid:. This should be the test identification number, the same as in record 2.

Record 8 - dstrelid: NONE

Record 9 - dtetrn: YYYYMMDD (this is the date this document was transferred to magnetic tape)

Record 10 - dlvacc: NONE

Record 11 - filcnt: RNN (where NN = number of raster image files in this document)

Record 12 - ttlcls: Unclassified

Record 13 - doccls: Unclassified

Record 14 - doctyp: Test Images

Record 15 - docttl. Conformance Test Package

Sample Document Declaration File

srcsys: Tested Systems, Inc., 123 Tester Drive, Philadelphia, PA 19191

srcdocid: 124C41

srcrelid: NONE

chglvl: ORIGINAL, 19890719

dteisu: 19890719

dstsys: Delta Information Systems, Horsham Business Center, 300 Welsh Road, Horsham, PA 19044

dstdocid: 124C41

dstrelid: NONE

dtetrn: 19890721

dlvacc: NONE

filcnt: R13

ttlcls: Unclassified

doccls: Unclassified

doctyp: Test Images

docttl: Conformance Test Package

Appendix B: Permissible Values for Raster Data File Header Records

All 11 records of the raster data file header records must be present, and contain valid and correct information. A list of the records and the information which they must contain follows.

Record 1 - srcdocid:. Refer to Paragraph 5.1.5 of MIL-STD-1840A

Record 2 - dstdocid: NONE

Record 3 - txtfilid: NONE

Record 4 - figid: NONE

Record 5 - srcgph: NONE

Record 6 - doccls: NONE

Record 7 - rtype:. Contains a '1' for compressed images, or a '9' for binary bitmap images

Record 8 - rorient:. Contains '000,270' for portrait, or '090,270' for landscape

Record 9 - rpelcnt: MMMMMM,NNNNNN (MMMMMM = # pels / line, NNNNNN = lines per page)

Record 10 - rdensty: 200

Record 11 - notes:. This record may contain a comment, or 'NONE'.

Testing Procedure

Instructions for Systems Undergoing Testing

Read These Instructions Before Proceeding Further

5.2.1 Inventory

The following should be found in the Conformance Testing Package:

1 copy of Testing Procedure - Instructions for Systems Undergoing Testing (this document)

1 Raster Conformance Test Specification sheet

1 Raster Test Release Authorization sheet

1 Raster Conformance Test Log sheet

1 Raster Test Incident Report sheet

1 Raster Conformance Processed Files sheet

1 Raster Test Results File sheet

1 sample packet of completed forms

_ reel(s) of 9-track magnetic tape @ 1600 cpi density

If any item on this list is missing, please contact the Conformance Testing Laboratory ("test facility") immediately.

5.2.2 Introduction

This document contains the instructions and information you will need to process the test images and complete the associated documentation forms and reports. Make photocopies of all of the enclosed forms (especially the Raster Conformance Test Log and Raster Test Incident Report sheets). Please note that, as of this point, any actions taken with the magnetic tape reels must be recorded as part of the testing procedure.

Each of the forms included with this package has a particular purpose and use in the test reports. The Raster Conformance Test Specification sheet is used to record a list of all files read from the tape(s). If the file is a raster file, the entry will also list the file type (compressed or uncompressed), image dimensions and orientation. You may also include a short description of the file's contents, although this is not required.

The Raster Test Release Authorization merely authorizes the test facility to release the results of the test to the National Institute of Standards and Technology. This should be completed by the supervisor or head of the organization responsible for the system being tested.

The Raster Conformance Test Log is used to describe the events that take place during testing. There are spaces for the date and time the event in question took place, a short description of what was done and what took place, and a space for incident references. If an incident requiring further description takes place, make a notation in the 'Incident Report #' column and fill out an Incident Report; major events, such as errors in processing or the end of a test run, are typical Incident Report topics. A separate log should be kept for each major phase of the test, for example, there should be a separate log for the compression of the uncompressed images, and for the decompression of Group 4 encoded images.

The Raster Test Results File sheet should be filled out by the test system's team leader, the supervisor or client representative for the company undergoing testing, and an observer of the proceedings involving the test. This is a certification that the documentation returned with the processed tapes is complete and accurate.

Every file processed and transferred back to magnetic tape should be entered on the Raster Conformance Processed Files sheet. Along with the image names, include the file's storage type (either binary bitmap or Group 4 code), tape the file is on (if there is more than one tape volume), image orientation and dimensions, and any comments you may have about the image.

There is also a sample packet of completed forms with this package.

5.2.3 Recommended Testing Procedure

The Raster Conformance Test Log ("log") must be kept up to date and accurate during all phases of testing, and a separate log kept for each of the major phases mentioned below. Each entry in the log should contain a brief description of the event, and the name of the software in use at the time the event took place. References to incident reports should be numbered consecutively. Each log entry does not require an incident reports; incident reports are generally reserved for events which have a major impact on the testing procedure or sequence, such as an error during image compression, the completion of a test run (successfully or not), a major catastrophe in the system's memory, or other event of similar magnitude.

The exact testing procedure will vary from system to system; however, the general procedure outlined below is applicable to all systems.

5.2.3.1 Initial Transfer of File Set #1 (Uncompressed Bitmapped Images)

The recommended first stage of testing is the transfer of the uncompressed binary bitmap files from MIL-STD-1840A tape format to a form which the system's Group 4 coder can process. As the files are transferred from tape, record the file name, image dimensions and orientation on the Test Specification Sheet. (If the system has appropriate facilities, the tester may also provide a brief description of the image on the test specification sheet.) Note the transfer in the log, along with any error events or incidents of note in incident reports. This step should be repeated until all files in File Set #1 are successfully transferred, as any information garbling at this stage will affect all other operations on File Set #1.

5.2.3.2 Compression of File Set #1

Compression of File Set #1 is the next step. The compression of each individual file should be recorded in the log, and incidents reported as appropriate. Note that some files may have negative compression.

5.2.3.3 Initial Transfer of File Set #2

The transfer procedure for the compressed image test set is approximately the same as that for File Set #1. The same information and parameters are recorded to the Test Specification Sheet and log.

5.2.3.4 Decompression of File Set #2

Decompression of File Set #2 should follow basically the same format as that taken with the compression of File Set #1. Make a notation of the decompression of each individual file in the log, along with any errors or especially noteworthy incidents in incident reports. At this point, the tester may optionally write a short description of the image on the Test Specification sheet. Please note that at least one image in File Set #2 may be improperly coded. It is not necessary to decompress an improperly coded image; it should not be included with the other files of File Set #2 when transferring the decompressed images back to tape. However, the incident report should document the coding error as fully as possible, e.g. line where the error was detected, nature of the coding error, etc.

5.2.3.5 Final Transfer of File Sets #1 and #2

At this point, all files in File Set #1 are encoded using Group 4 compression, and all files in File Set #2 are in binary bitmap format (barring the file(s) with improper coding). These files will then be transferred back to magnetic tape as two separate documents, File Set #1 comprising one document and File Set #2 comprising the other. Once again, enter these events into the log, and record any errors or other significant events in incident reports. Repeat this step until it is

performed without error. Note also that if your original test set contained one magnetic tape, both documents should be returned on a single tape; if the test set contained two tapes, then the documents should be stored on separate magnetic tapes.

As each document is stored to tape, enter it on the Raster Conformance Processed Files sheet.

5.2.3.6 Completion of Report Forms

The Raster Test Release Authorization sheet must be completed by an individual with the authority to authorize the release the results of the Conformance Test to the National Institute of Standards and Technology.

The conformance test team leader, an authorized client representative, and a designated observer who was present during the entire test must complete the Raster Test Results File form. This form states that the returned documentation is the complete and accurate record of the testing and processing performed.

5.4 Test Package Return

Mark the processed tapes clearly, and indicate their contents. Return to the test facility a package containing the reel(s) of magnetic tape containing the processed images, the completed test log, all associated incident reports, the completed Results File sheet, and the completed Release Authorization sheets. The absence or

incompleteness of any portion of the test package will result in a negative evaluation by the test facility.

Raster Conformance

Test Specification

Client Request Number: _____

Client Name: _____

Test Cases

(List both compressed and uncompressed images)

Filename	Orientation	Dimensions	Comments/Notes

Raster Test
Release Authorization

_____ hereby authorizes the
(Company Undergoing Test)

Conformance Testing Laboratory _____

to release the Conformance Test Report to the National Institute of Standards and Technology for general distribution. The test is identified as: _____.
(Client Request Number)

Authorized Signature: _____

Name: _____

Title: _____

Date: _____

Raster Conformance
Test Log

Client Request Number: _____

Test Description:

Date / Time	Activities and Event Entries	Incident Report #

Raster Test
Results File

Client Request Number: _____

Software Identification: _____

_____

The undersigned certify that the material and records contained in this file are all those and only those associated with the above identified Group 4 Compression / Decompression test.

_____ _____
(Team Leader) (Affiliation)

_____ _____
(Client Representative) (Affiliation)

_____ _____
(Observer) (Affiliation)

Raster Test
Incident Report

Client Request Number: _____

Incident Report Number: _____

Description of Incident:

Impact of Incident Upon Test:

Raster Conformance
Processed Files

Client Request Number: _____

Client Name: _____

Test Cases

Filename	Storage	Tape #	Orientation	Dimensions	Comments